



Designing a program of teacher professional development to support beginning reading acquisition in coastal Kenya



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ABSTRACT

What should be considered when developing a literacy intervention that asks teachers to implement new instructional methods? How can this be achieved with minimal support within existing policy? We argue that two broad sets of considerations must be made in designing such an intervention. First, the intervention must be effective by bridging the gap between current teacher practice and the scientific literature on effective instruction. This broad consideration is detailed with 10 design recommendations. Second, the intervention must be amenable to being scaled-up and mainstreamed as part of government policy. This involves being (i) simple and replicable; (ii) well received by teachers; and (iii) cost effective. The paper describes how these factors were considered in the design of a literacy intervention in government primary schools in coastal Kenya. It also includes reactions from teachers about the intervention and their change in knowledge.

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1. Introduction

Among the multitude of factors influencing student outcomes in sub-Saharan Africa, the knowledge and practices of teachers has arguably the most direct effect and has the greatest potential for intervention through government policy. Many teachers lack confidence in their abilities to improve student learning, even when they rate themselves as professional and considerate of their students' needs (Onderi and Croll, 2009). Other teachers may be dedicated to their profession but recognize that they do not have the necessary pedagogical knowledge to influence all students' achievement (Dubeck et al., 2012), notably those struggling with learning to read in non-native languages.

The feeling that some teachers have that children in sub-Saharan Africa are not reaching their academic potential is supported in the data (UNESCO, 2010). It predominantly shows that children in upper primary grades have minimal reading skills. Furthermore, recent

efforts examining reading abilities for children in lower primary confirm what was observed in the upper grades – children's reading skills are lacking (Gove and Cvelich, 2010).

The situation in Kenya also points to low literacy levels (Onsumu et al., 2005). Data from Uwezo's survey in 70 Kenyan districts show that among grade three children, only 28% can read a Grade 2 English passage and just 36% can read a Grade 2 Swahili passage (Hoogeveen and Andrew, 2011). Other survey work found that 25% of the children could not read a single word in a grade level paragraph (Gove and Cvelich, 2010).

This evidence calls for a greater emphasis on improving academic outcomes for students. Substantial meta-analyses conducted largely in industrialized countries conclude that the methods used to teach reading have a key influence on successful literacy acquisition (August and Shanahan, 2006; NELP, 2008; NICHD, 2000). When instruction develops oral language skills (e.g., phonological awareness and vocabulary) and explicitly and systematically explains the relationship between sounds and symbols (i.e., letters), children have the foundation for word identification and reading comprehension. Therefore, to offer effective reading instruction, teachers need to acquire this knowledge and the pedagogy to teach others

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how to read. Yet, the optimal way to encourage teachers to provide instruction that is aligned with current understandings remains an open question.

Present efforts in sub-Saharan Africa attempt to answer this question. In Kenya, [Hardman et al. \(2009\)](#) found that a systematic in-service training was most influential on classroom practice in math and sciences. In Liberia, a randomized trial using a literacy coaching model in which a trained expert serves as a supportive role to the teachers' developing knowledge has shown promising results ([Korda, 2011](#); [Davidson and Hobbs, 2013](#)). In the Gambia, nationwide in-service training program for all lower primary teachers was implemented in response to low literacy levels ([Gove and Cvelich, 2010](#)). Elements from these interventions informed our design.

1.1. Study context

The study took place in 51 government schools on the coast of Kenya, as part of a larger evaluation of both a health and literacy intervention (the HALI project; [Brooker et al., 2010](#); [Halliday et al., 2012](#)). Kwale District was identified by the Ministry of Education as a good site for our research because of its poor performance on the Kenya Certificate of Primary Education (KCPE), a test given to students at the end of primary school. The district was ranked as the seventh poorest of 76 districts in the country and second poorest of the districts in the Coast Province¹ ([RTI International, 2008](#)). Data released during our implementation identified that three-fourths of the population of Kwale lived in poverty ([Commission on Revenue Allocation, 2011](#)).

Our previous work has identified barriers to improving pedagogy in the region ([Dubeck et al., 2012](#)). For example, the Kenyan government policy does not mandate that a single teaching method should be used ([MOEST, 2006](#)). Instead, the policy states that the teaching methods should meet the students' learning needs and the objective for the lesson ([Commeyras and Inyega, 2007](#)). For reading, these methods could include teaching the relationships between sounds and the letters that represent them (i.e., phonics), teaching words as a whole (i.e., look-say), or another method identified by the ministry (e.g., the sentence method). A related barrier to methods of literacy instruction is the language of instruction that children learn to read and write in first.

The Kenyan national education policy specifies the use of the *mother tongue* (i.e., the local language spoken in a student's home) as the language of instruction in grades 1 through 3. From grade 4 onward, the policy states that English should be the language of instruction ([Gacheche, 2010](#); [Muthwii, 2004](#)). Yet, practical implementation of this clear national policy is not always possible in communities where multiple languages are used. In the schools we worked were communities of the Mijikenda, made of nine language groups (e.g., Digo, Duruma). In this context, a single language did not always dominant in a school and even if one did, the language of the teachers did not always align with the broader language community. If a school had a dominant language with a teacher qualified to teach it, the lack of instructional materials in the local languages would have been another barrier.

These diverse schools responded to these language realities and considered the preferences of the school community, the abilities of the children, and the available instructional materials. Ultimately, they used a mix of languages, including local languages to instruct in the international language of English and the Swahili (i.e., Kiswahili) the lingua franca of the region and the country. Generally, teachers and school communities were comfortable focusing on English and Swahili in the early grades as they perceived doing so conveyed benefits on the primary leaving exam in grade 8.

Our work ([Dubeck et al., 2012](#)) suggests that teachers on the coast of Kenya follow the curriculum and use the contents of the English and Swahili textbooks to teach reading which results in an emphasis on teaching oral language skills. These teachers see the value in changing the instructional methods to improve reading outcomes, but they feel they do not have the capacity or the resources to alter their methods. Furthermore, they see the complexity of related issues (e.g., poor children's health, lack of resources, multiple languages) as impediments to their students learning to read efficiently ([Dubeck et al., 2012](#)). Therefore, the current question is how to implement a program that promotes effective instruction given these barriers.

The aim of this paper is to outline the components of an intervention designed to improve literacy instruction amidst the constraints outlined. In the following sections, we first outline the elements of the intervention and then highlight two broad sets of considerations in developing this intervention. First, we aimed to design an intervention that would be successful in improving literacy outcomes. This involved bridging the gap between current teacher practice and evidence-based recommendations for the most effective methods of literacy instruction. This broad consideration is detailed with 10 design recommendations. Second, we aimed to develop a program that could be scaled up and adapted as part of government policy on professional development. Key considerations here were (i) making the intervention simple and replicable; (ii) assessing how teachers perceive the intervention; and (iii) the cost of the intervention.

2. The HALI literacy intervention

2.1. Design considerations: bridging the gap between current practice and evidence-based recommendations on effective instruction

The HALI literacy intervention was designed to be compatible with successful models of literacy acquisition in an alphabetic language while taking into account the current teaching practices we had observed in the area as well as the perceived barriers to successful instruction ([Dubeck et al., 2012](#)). Importantly, the literacy intervention was not intended to be an independent curriculum for teaching reading in English and Swahili. Instead, the goal was to supplement the existing curriculum with methods to develop foundational literacy skills that did not have adequate attention previously. The major ideas of the intervention are based on an analysis of the scientific literature ([Adams, 1990](#); [August and Shanahan, 2006](#); [Hoffman et al., 2003](#); [NELP, 2008](#); [NICHD, 2000](#); [Pressley et al., 2001](#); [Tollefson et al., 1985](#)) on effective literacy instruction and how it relates to current teaching practices in the region. Below we summarize ten key recommendations from the literature and the steps we took to support their implementation in the HALI literacy intervention.

We chose to address these recommendations for reasons beyond being supported in the literature. One, these recommendations build from what the teachers are already doing and their stated perceptions, as ultimately we consider teachers as partners, not mere implementers. Two, these recommendations allow teachers to see children's current language abilities as assets, not deficits to non-native literacy acquisition. Three, these recommendations do not require many resources. Four, these recommendations, combined, should lead to noticeable changes in children's reading acquisition which we would motivate the teachers to remain involved. Yet, ultimately, we were interested to know if these recommendations would be relevant to the coastal Kenyan context.

1. Instruction matters.

Issues such as poverty, poor health, and limited resources complicate academic achievement ([Badian, 1988](#); [Heath, 1983](#);

¹ With the new Constitution in 2010, counties replaced provinces in Kenya.

Jukes et al., 2008). But despite systematic problems, teachers can provide instruction that promotes reading achievement (August and Shanahan, 2006; NELP, 2008; NICHD, 2000). This finding underpins and justifies our approach.

2. Reading skills in one language are facilitative to another.

Kenyan education policy guides schools to begin instruction in the mother tongue before transitioning into English in grade four, yet that policy is not practiced in the sample schools. Instead, the schools in this study use a combination of Swahili (the second language for most children and the lingua franca of the region) and English (the third language). When developing the intervention, the majority of teachers suggested that it should be in English only. The preference for English at the expense of the language the children know best led us to discuss with the teachers how developing literacy skills in one language are considered resources that aid literacy acquisition in another (Lindsey et al., 2003). Furthermore, teachers examined evidence that suggests that exposure to a language with a transparent orthography (e.g., Swahili) may help when reading in a language with a deeper orthography (e.g., English) (Abu-Rabia and Siegel, 2002). Consequently, we designed parallel lesson plans in both Swahili and English languages.

3. Reading development occurs in distinct, predictable stages that reflect a growing understanding of the relationship between print and speech.

All children pass through these stages even if their rate of trajectory varies (Scanlon et al., 2008). Teachers are guided to consider children's errors as a place to begin instruction. For example, if a child represents (i.e., spells) the word sad as ct, the teacher is encouraged to not look at what is wrong but to look at what is correct and what the child needs to learn. In this example, the letter c sometimes says the sound of /s/, the sound of d and t are minimal pairs² and the child needs to learn to include a vowel in all syllables. Our intervention was designed to take children through the various stages of literacy development and to help teachers work with different ability levels in the same classroom.

4. Developing a concept of word in text is a crucial step in reading acquisition.

Prior to our intervention in schools in coastal Kenya, we observed the practice of using song and memorized phrases to build oral language. This practice can be even more effective for beginning reading if text is introduced to accompany the activity to help to develop a concept of word in text. After the rhyme is memorized, children attempt to track the text, which uses their knowledge of the beginning sound and the empty space between words to recognize word boundaries (Morris et al., 2003). The use of beginning sounds is an early phonological skill that connects phonological awareness to print knowledge. Once a student has gained a concept of word, she is considered a beginning reader. We developed a number of lesson plans that focused on developing children's concept of word in text.

5. Finger-pointing to text is important in early reading.

Prior to the intervention, teachers did not encourage children to touch the text as they read. Finger pointing helps children to make a voice-to-print match, which develops phoneme segmentation (i.e., breaking apart sounds), which is important for beginning spelling (Uhry, 2002). In our lesson plans and training we emphasized the importance of pointing to text during beginning reading.

6. The alphabetic principle, an understanding that letters represents speech and carry meaning, must be systematically and explicitly taught.

Systematic instruction means that the skills start with the simple foundational skills before adding complexities in a predetermined sequence. The preplanning ensures that all skills are covered. Explicit instruction is such that the information needed to master a skill is clearly described and modelled by the teacher (Adams, 1990). Thereafter, the children are guided to use the new skill with teacher feedback. Our intervention introduced skills systematically and taught teachers how to be more explicit.

7. A print-rich classroom supports beginning reading acquisition.

Children benefit from having text to read in their environment if they are going to become readers (Neuman, 2004). This means that teachers should display text throughout the classroom as well as provide children opportunities to practice reading, to write sentences, and to use letter cards to make words. We worked with teachers to help them create materials that could increase the amount of text in the classroom.

8. Choral reading of text occurs within a series of related oral reading activities.

Prior to our intervention, we observed extensive use of choral reading, when all children read orally in unison. Rather than replacing this practice, the HALI intervention aimed to utilize and build on it while highlighting that it should be used but within a structure of releasing responsibility to the children. With a gradual release model, the balance of reading switches from the teacher to the student as they progress from choral reading to echo reading to partner reading to whisper reading.

9. Comprehension includes making predictions, evaluating, and making connections about text.

Engaged reading leads to increased understanding of the text, which is brought about by motivation and by thoughtfulness (Guthrie, 2004). A reader who knows there are multiple correct ways to respond to text will have a higher degree of self-efficacy, or the feeling they can do the task. Plus, when teachers create opportunities for students to use higher order thinking they increase engagement and learning. The HALI intervention aimed to increase diversify the type of comprehension activities to engage the children.

10. Orthographies are more regular than irregular.

In our observations before our study, we had seen some teachers show children how to combine syllables to read Swahili words while teaching English through whole words. They said they felt comfortable doing so in Swahili because it has consistent letter-sound relationships whereas English does not. The intervention attended to recognizing teachers' perception that English was complex but even within its opacity, it can be explained by sound, pattern, and meaning layers (Templeton, 2002).

2.2. Design considerations: developing an intervention which can be scaled and mainstreamed

We designed the literacy intervention based on the principle that, in order for it to be cost effective and implemented with minimal support, it need to be simple, well-defined and with relatively few activities and should not interfere with teachers' regular responsibilities. We also recognized that a simple intervention could be replicated more easily during scale-up. Therefore, we restricted the intervention to an initial 3-day professional developmental workshop and two, one-day follow-up workshops. In order to

² They share a point of articulation in production. The difference is that the letter d is voiced and the letter t is unvoiced.

facilitate implementation of the program with minimal direct interaction with teachers, we provided a teacher manual with partially scripted lesson plans, distributed basic instructional materials, and offered ongoing support via weekly communication which included text message exchanges.

2.2.1. Professional development workshops

The literacy intervention contained several workshops for teachers. The workshops were delivered by a Kenyan university education professor (the fifth author), a retired Kenyan teacher educator, and a literacy researcher (the first author). The structure of the three workshops was similar. They included an overview of the theory supporting the various methods, videos related to children's literacy acquisition, lesson demonstrations, time to practice the methods, interactive discussions, and sessions to make instructional materials to use in the classroom.

The initial three-day residential training was held in year one, term one. Its purpose was to provide the class one teachers with background information about how children learn to read, to explore and practice the lessons in the provided teacher manual, and to give them the opportunity to customize instructional materials for use in their classrooms.

A one-day follow-up in year one, term two was held to discuss and practice methods that were not covered in the initial workshop. Plus, teachers gave feedback on the intervention in focus group discussions, and they observed recently recorded classroom videos of their peers delivering the lessons in the teacher manual.

A two-day refresher workshop was held in year two, term one. By this time, a third ($n = 22$) of the originally trained teachers were no longer teaching the study children because they had switched grades or transferred schools. To mitigate the attrition, a two-day training was held to introduce the manual to the new teachers while the returning teachers benefited from joining on the second day and assisted the new teachers as needed. All teachers made instructional materials for their classrooms and practiced using the lessons in the manual. Individual interviews were conducted with a representative sample.

2.2.2. Teacher manual

The lesson plans were designed for the current study and build from existing teaching methods (e.g., choral repetition, use of song) seen in the area (Dubeck et al., 2012) and show teachers how these methods can be modified slightly to promote successful beginning reading instruction. The organization of the manual is intended to serve as an independent intervention if a teacher did not attend the workshop. The lessons are structured to guide the teacher in what to say, what to do (i.e., with their hands or materials), which instructional materials to use, and the estimated time of the lesson. At the bottom of each lesson plan is a place for teachers to record the date of use and notes that could be shared with the research team. The manual was printed locally and stored in a sturdy box file.

The manual offers three distinct sections: (a) the first section contains 24-pages of resources and explanations for the lessons used in sections two and three. It is designed for the teacher who wants more information and to extend student learning; (b) the second section has 140 daily lessons that develop foundational literacy skills in English and Swahili. We expected teachers to use one lesson for 35-min per day proceeding sequentially; (c) the third section offers optional bonus activities and games for beginning literacy. Most of the bonus activities are scattered throughout the daily lesson section so teachers are familiar with them. They can be used in English or Swahili.

The content of the manual develops foundational literacy skills including concept of word in text, letter sound relationships, blending, spelling, reading connected text, phonological awareness,

Table 1

Section 2 of the teacher manual.

Focus of daily lesson	Language use	Quantity
Concept of word	English and Swahili	24
Letters; make-a-word	English	33
Blending; connected text	English	36
Blending; make-a-word	Swahili	30
Vocabulary; comprehension	Swahili	30
Phonological awareness; alphabetic; vocabulary; comprehension	English and Swahili	21

vocabulary, and comprehension. Table 1 provides an overview of the content in section two of the manual.

2.2.2.1. Concept of word in text. These lessons build from teachers' existing practice to have children memorize songs or other oral pieces. The difference is that now the text of the memorized language is shown for children to attempt a voice-to-print match. The provided texts are traditional engaging English and Swahili rhymes.

2.2.2.2. Letters. The instruction is systematic because it begins with the easier sounds (e.g., continuants/s/and/m/) and commonalities between languages before progressing through all of the letters. It is explicit because the teacher uses exaggerated modelling, visuals, articulatory gestures, and an associated alliterative vocabulary word (e.g., the letter d, dance).

2.2.2.3. Blending. The blending lessons provide teachers with a list of words that use the letters and syllables that had just been practiced in isolation. The teacher demonstrates the blends using large cards hung from a string across the room or in a provided cloth pocket chart.

2.2.2.4. Make-a-word. In this engaging activity, each child is given an individual set of letters that were just practiced in isolation and blending. The teacher guides children to read or spell words changing just one sound between each word. The limited letters and changes as well having their own set of letters promote student success.

2.2.2.5. Connected text. Because children need opportunities to read with fluency, the words that were blended, spelled, and read in isolation are also used in short decodable sentences. Children are reminded to use finger pointing and practice choral, echo, partner, and whisper reading.

2.2.2.6. Comprehension. The decodable sentences have related questions and responses to develop comprehension skills. Also to accompany the short stories are text-based and situation-based questions that encourage the children to predict, to connect, and to evaluate the text. Furthermore, some lesson plans provide graphic organizers that develop comprehension and can be used across the curriculum.

2.2.3. Materials to increase text

One of the principle ideas of the intervention was to increase the amount of text the children see in the classroom. Therefore, we provided teachers with materials distributed over several time points (at the workshops) to aid their efforts. Teachers were given paper of various sizes and writing utensils to create materials and supplies (e.g., string, clips, tape, cloth pocket chart) to display text in the classroom. In addition, sets of two-inch paper letters and storage envelopes for each child were provided. During the workshops, teachers made phonics wheels, flip books, posters for graphic organizers, and blank books for student stories.

2.2.4. Ongoing support and monitoring: interactive text messages

After the initial workshop, we communicated weekly with teachers via text messages to offer information and motivation to implement the lesson plans. The text messages suggested further instruction (e.g., please remember to have children finger-point as they track the text), shared instructional ideas (e.g., teacher X at school X uses the pocket chart to display the 'Be the Sentence' activity for pupils to use independently) or helped to monitor progress and understanding of lessons (e.g., please tell us which lesson you like using). A response was required in order to receive a small top-up for their mobile phones, which facilitated use and provided an incentive for further communication.

2.2.5. Teacher reactions to the intervention

Teachers' response to the intervention was a key indication of the potential effectiveness of the program and its potential for adoption beyond the study area. We collected data on teachers' response to the intervention from four sources:

2.2.5.1. Text messages. As discussed in the previous section, the text message response required from teachers provided valuable information about teachers' perceptions to the intervention. The content of the messages illuminated the extent the teachers understood and followed the intent of the intervention. These data framed the content of upcoming text messages as well as the two follow-up trainings. The frequency of teacher response was also used as a measure of engagement with the intervention.

2.2.5.2. Weekly summary sheets. Another way we collected data from teachers was through weekly summary sheets. Teachers were requested to track the lessons they used each week, what worked well, and suggestions for improvement on a standardized form. We collected these periodically (i.e., during health visits, at follow-up workshops) and were able to track how students and teachers perceived the intervention. The weekly summary sheets served as fidelity check of the intervention as they helped us to explore to what extent the lessons were being used and guided topics for the weekly text messages and the follow-up trainings.

2.2.5.3. Focus groups and individual interviews. During the follow-up trainings, Kenyans on our team not directly implementing the literacy intervention led a combination of small focus group discussions (6 to 10 people) and individual interviews. We used this input to monitor the level of support we provided.

2.2.5.4. Teacher knowledge surveys. The teacher knowledge survey (TKS) developed for this study assessed knowledge of language and pedagogy. For example, one section of the TKS has 12 selected-response items related to beginning reading instruction in English and Swahili (e.g., How many sounds are in the English word 'check?'). A teacher who knows that the English word check has just three sounds even though it has five letters is in a much better position to help her students learn to read and spell.

3. Results

We now present the findings on teachers' perceptions to various components of the intervention. The results on children's outcomes will be presented in a paper forthcoming paper (Jukes et al., in prep).

3.1. Professional development workshops

The workshops were well received by the teachers and they suggested more and longer ones. When we probed for specifics, comments such as, *To break the classroom boredom. Because in this*

*forum you meet different people and share your ideas, were representative of their desire to learn new methods, develop camaraderie with other teachers from the region, and change in routine. We also learned that they preferred the practical aspects of the training to the theory. One comment was representative of what many teachers said, *What I can say is there was a lot of theory.* Therefore, the subsequent workshops included more practice to explore the provided lessons because they, *Want to go through the file (the manual) because there (at the schools) we don't have the time to go through the file so up to now there are some things we don't know.* And the practical aspects of the training seemed to influence their instruction, *How to teach blending and letter sounds. I got that message and when I applied it in the classroom situation it worked and I did not see any inadequacies of operating in the classroom.* Other comments suggest that they see the efficacy of the lessons in the manual.*

3.2. Teacher manual

For many teachers it was the initial use of some of the methods and they commented on their utility. *I like making words and blending them together.* While other teachers commented on the overall approach. *I really like the methodology. The new methods of teaching compared to the ones we had, they have really assisted in making a change in classes like the phonetics, letter making, sounds.* And some teachers expressed a desire to share them with others. *I try to call my colleagues from Standard two and three and introduce them to the lessons. They are trying it and they are very much curious to learn it. They find it very much enjoyable and it helps the children.* We also have comments on the children's responses to the intervention lessons. *Because before changing to the HALI lessons the pupils were having a very hard time reading. But since I started teaching them how to read and get letter sounds they can even read the words without my help.*

Teachers shared their opinions about the lessons provided in the manual. First, we learned that the amount of time to teach the Swahili lessons was more than we had estimated. *If you want to teach it properly you take more than 45 min.* But even though many teachers had a similar sentiment, they felt the time was useful. *I normally go beyond the period schedule only that my pupils enjoy it so much and I find it is helping even in the other lessons. HALI lessons helps even to teach in understanding the English, Kiswahili (i.e., Swahili) and the rest of the subjects although it normally consumes quite a lot, so I normally use two periods.* Thereafter, we encouraged teachers to use those lessons over two separate 35-min classes instead of just one. Similarly, based on the progress that the teacher made in the first few months, we realized that the daily lessons that we had intended to use for just one school year would be sufficient for two.

3.3. Materials to increase text

The materials were well received yet were not without problems. Most frequently teachers identified how the materials enhanced their instruction with comments such as, *The string and those small paper cards – they normally work very well when I am teaching blending and I have a string so I can put the letters there then I merge them. They (the children) form a word and I form a word on the other side.* Yet, the teachers whose classrooms do not have doors or cabinets have an added responsibilities to avoid theft. *There is nowhere to keep things so what I do I normally is shift the teaching materials. In the evening, I have to collect those things. So I normally use the rubber bands to roll the charts and the reading cards and in the morning I transport them back to class.* Or their efforts to increase print on the walls were impeded by theft. *Sometimes you fix charts and find that they have been plucked.* Or the cards with words and

letters created by the teachers were also lost to theft. *During the weekend they cut the strings through the window then they pull it away and take the pegs and throw the cards away. At the follow-up training, teachers strategized how to manage theft and other problems. Other collaboration was seen when one teacher said that she had difficulty efficiently distributing reading materials to each child another teacher offered, You should chose either three children or four children to assist you. Just select three or four: If the name is written on them (envelopes), it is very easy. The children can give out.*

3.4. Compliance

Even though teachers reacted positively to the intervention components, their use of the provided lessons varied. During the first 26 weeks of the intervention, the 62 teachers averaged 54.6 lessons, or about two per week. The standard deviation of 28.89 showed the variability of use. For example, one teacher reported teaching 144 lessons, which would be approximately one per school day. Conversely, two teachers reported teaching nine lessons during the 26 weeks. Some teachers described the interferences to using the lessons. *I think my school seems to be having more problems than expected so it has been taking a lot of time to teach not only the HALI lessons but also even the other lessons because... since in most cases we have the headmaster out and the deputy is on attachment, so I play more roles than just a classroom teacher.* And another teacher said, *I am loaded with responsibilities there (in school).* In regards to materials, we observed that over 90% of the teachers displayed materials (e.g., pocket chart) to increase the amount of visible text in the classroom.

3.5. Children's response

Teachers reported that the children responded positively to the intervention lessons. Their anecdotes suggest that the children were engaged. *To my side, my pupils they are very much interested in the lesson, in fact, they say they want the HALI lesson daily.* And this engagement might lead to improvement as described by this teacher. *In fact we can say some of the Standard one's can read more English words than some of the class two's.* And some teachers connected the lesson specifics. *(They) like blending best because they enjoy doing it and always brighten up and become lively and can now spell easily.* Furthermore, teachers saw that some of the skills learned in the intervention lessons were utilized in other subjects. *(They) use HALI behaviours – like making connections and predictions in other lessons like maths and social science.* And the children differentiated between the intervention lessons and the regular curriculum as evident by this comment; *They know a HALI lesson has a lot of activities unlike the other lessons.* We also have evidence of child engagement when many of the teachers stated something such as *They (the children) have superb response and always remind when I forget to teach HALI lessons.*

3.6. Teacher knowledge

Teachers' knowledge about beginning reading instruction seems to have been influenced by their involvement in the literacy intervention. The teacher knowledge survey (TKS) was administered at two time points. It was first administered before the start of Year 1 of the intervention to 59 teachers from the 51 control schools and 48 teachers from the 50 control schools. A non-significant group difference was found between these randomly assigned teachers. The TKS was administered a second time at the start of year two in the intervention condition to the 36 returning teachers and the 22 new teachers who had replaced teachers due to attrition. Because the returning teachers had participated in year

Table 2

Mean scores on teacher knowledge survey for teachers one year into the intervention versus teachers just starting the intervention.

	One year HALI training March 2011 (n = 36)	No HALI training March 2011 (n=22)	d
Knowledge survey	8.65 (1.47)	6.68 (2.29)	1.07

Note. Standard deviations are in parentheses.

one of the intervention including attending the trainings, exchanging text messages, and using the manual and the new teachers had not been involved at all, we had an opportunity to test the effects of the intervention as measured by differences in the TKS.

Table 2 shows that knowledge scores were higher among trained teachers ($p < .05$, analyzed with a t -test). The effect size was large (Cohen's $d = 1.07$ correcting for bias based on Hedge and Olkin's (1985) factor), indicating substantial differences between the two groups of teachers.

In addition to quantifiable gains in knowledge, teachers also identified changes in their abilities to respond to student needs. One teacher commented, *I used to teach but I didn't know why the pupils could not read the words until I entered into this programme and I had to go back to the letter name and sounds. I realized when I started from there they are now able to read.* Furthermore, they appeared to be more confident to comment on student growth and monitor progress. *So previously, before the HALI lesson children could read three or four words out of 30 words. But since the lessons started, I think I sent an SMS to say there is a very big change. With that list of 25 words, the majority of them are able to read twenty. In that sense, I am able to monitor that now they are improving.*

3.7. Weekly text message

The text messages (SMS) were effective for several reasons. For one, they helped to maintain regular interactive communication. The average response rate averaged 87% for the 37 weeks that we asked a question in year 1 and 84% in year 2. Secondly, the text message exchanges helped to keep teachers motivated to use the HALI lessons. One said, *SMS's are good because they motivate me to teach the HALI lessons.* And the text messages were considered informative. *I find them to be educative. I get new ideas sometimes from the SMS.* Finally, they helped to monitor teachers' involvement in the intervention. Often we learned positive news, *Wow! Pupils are really enjoying forming words using the cutout of the alphabetical letters.* Yet, we also received distressing news such as when a teacher would leave the school and essentially so did the literacy intervention. *Hello am also fine & I enjoyed holiday, plz am not at RPS. Have gone to another school. Nice time.* The text messages also helped us gauge which methods were the most engaging to the children or those that the teachers preferred (and ultimately used) which encouraged us to promote those methods in the follow-up training. Furthermore, we learned when the original intent of the method was not translating well into practice so we shared tips on how to use the method.

3.8. Costs

In order to develop an intervention that could potentially be adopted by the Kenyan government it was important to keep costs in proportion to the national primary education budget. The need to develop a cost-effective intervention drove many of the design decisions. In particular, costs were reduced by conducting a relatively short initial professional workshop and by the decision

Table 3
Summary of total, direct and indirect cost (US\$ 2010).

	Total cost	Direct cost ^a	Indirect cost ^b
District level programme	32,940	25,049	7907
Per teacher	531	404	128
Per child	8.57	6.52	2.06
%		76	24

^a Direct costs includes all financial expenditure.

^b Indirect costs include the opportunity cost of teacher and ministry officials during training and program support.

to support teachers through text messages rather than in-person coaching.

In order to assess the cost of the intervention a costing model was developed based on the various components or cost centres of the literacy intervention. Intervention components were identified and cost information was collected from direct observation of the intervention, review of study records and interviews with key informants within the wide RCT, at study schools and at the Ministry of Education. These components are (a) the teachers' manual, (b) the provided instructional materials, (c) text message (SMS) support, (d) the initial teacher training, (e) follow-up teacher training and intervention administration at the district level. Within each component, micro-costing was undertaken according to an ingredients based approach commonly used in healthcare economic evaluations (Drummond et al., 2005). Each element or ingredient of the cost centre is identified, measured, and valued. Costs pertaining only to research activities were excluded. Each cost centre and the ingredients within it are stratified by resource type (a) consumables, (b) personal, (c) transport and (d) overhead or facility costs. Costs are reported as program cost, the cost per teacher and the cost per child. The program cost here refers to an intervention modelled closely to the trial scenario, covering approximately the equivalent of one Kenya district with 62 teachers and 3844 children.

Costs were collected in Kenyan shillings (KSH) and adjusted to 2010 values using the Kenyan consumer price index where necessary. For wide accessibility, costs are presented in US\$ 2010 using the average 2010 exchange rate (www.oanda.com). Financial costs were defined as direct costs and the value of resources for which no additional expenditure was required by the intervention were defined as indirect costs. A one-year time horizon was used so discounting was not applied. This costing takes a provider perspective that only costs to the Kenya government were included, although we believe non-provider costs would be negligible.

The total cost of the modelled district level program was US\$ 32940 (Table 3) or US\$ 531 per teacher and US\$ 8.57 per child. Direct financial costs comprised US\$ 76 of the total cost.

Table 4 describes the cost breakdown by intervention component and resource type. It is most easily accessed by the percentage of total costs where we can see that three main intervention

component contributors to cost were (a) the initial training (32.4%), (b) the teacher materials (28.6%) and (c) the SMS support (20.4%). Consumables were the greatest driver of costs from the resources types (53.7%).

4. Discussion

This paper describes the literacy intervention investigating ways to improve academic achievement for children in lower primary classrooms in coastal Kenya. The main goal of the intervention was to develop teachers' capacity to influence their students' literacy achievement. The intent was not to implement a full curriculum but rather to explore the amount of support needed to facilitate teacher's use of the intervention methods shown to be effective in other contexts. To that end, we explored two sets of considerations to learn their role when designing an effective literacy intervention.

Our first consideration examined how to bridge the gap between current practice and teacher perception to recommendations based on the scientific literature on effective instruction. This consideration was detailed with 10 design recommendations. We found that teachers will implement new instructional methods that build from their prior experiences and we made these connections obvious in all of our interactions. Instead of telling teachers what they were doing wrong, we advised them on what they were missing or what could be reduced. Specifically, instead of telling teachers their children were singing too much, we reframed the activity to include displaying the related text as it would help to develop print concepts, phonological awareness and letter sound relationships. Secondly instead of telling them that their use of whole word instruction to teach reading was inefficient, we highlighted the local teachers who had some ability to teach the alphabetic principle in Swahili so that skill would be more readily accepted when teaching English blending and segmenting. Finally, instead of telling teachers that choral reading should be stopped, it was ordered within a continuum of reading skills outlined previously. Whenever we could, instead of telling teachers what was lacking in their previous methods, we attempted to align their methods within the existing literature on beginning reading instruction.

Our second set of considerations involved designing an intervention that could be replicated, scaled up, and adopted by the government. Our description suggests that we met these considerations in several ways. First, the intervention materials were locally sourced and accessed. This consideration allowed for a common understanding of materials but with a novel way of using them. For example, teachers saw the benefit of using small pieces of paper to provide each child with a set of letters to read and spell words as described previously. Or some teachers collaborated with colleagues in non-study schools or other grades to show how hanging items from the ceiling with string could increase learning opportunities. Nevertheless, although we consider materials such as a paper, writing utensils and string as simple, they were appealing and some teachers had to be concerned about theft. We find further

Table 4
Program cost by resource type and intervention component (US\$ 2010).

Resource type	Intervention component						Total	%
	Manual	Teaching materials	SMS support	Initial training	Follow-up training	District admin		
Consumables	1454	8911	5596	1735	–	–	17,695	53.7
Personnel	35	195	1005	3785	1954	1078	8052	24.4
Transport	–	330	–	942	942	–	2215	6.7
Facility	16	–	107	4206	349	300	4979	15.1
Total	1504	9437	6707	10,668	3246	1378	32,940	
%	4.6	28.6	20.4	32.4	9.9	4.2		

evidence for the simplicity consideration by the teachers who self-reported using the new methods voluntarily in subjects outside of the intervention which is related to the next consideration.

We also considered the perception of the intervention by the teachers. From teachers' self-report through various methods (e.g., text messages, weekly summary sheets, focus group discussions) we find that teachers will use both partially scripted lesson plans and those that have more flexibility for a limited amount of time. As a result, teachers stated that their involvement increased their comfort discussing ways they can influence children's reading achievement. Furthermore, their high response rate to the text messages, attendance at the trainings and willingness to share their opinions suggests that teachers wanted to engage with the project team. As mentioned, teachers were not compensated for their role in the HALI study yet they seemed to appreciate the collaborative nature of the research study. In other words, perhaps the professional, interactive way they were treated by the project team enhanced teachers' experiences.

The final consideration for designing scalable intervention is cost. This paper showed that the professional development costs consumed the greatest share of the US\$ 8.57 per child. At 32% of the costs, the knowledge that the teachers acquired will continue to remain with them even when the actual materials are depleted. Specifically, a teacher who has exhausted her supply of poster paper but knows the value of a print rich classroom might make efforts to increase print through other means. And we do not need to speculate about increased knowledge about early literacy. After one year in the study, intervention teachers' knowledge related to beginning literacy instruction was significantly higher than those just entering the intervention.

4.1. Limitations

Despite these positive findings presented, our findings have a number of limitations. A major concern is that the findings of this paper are presented in the absence of any evidence that students learning improved as a result of the intervention. Data analysis is ongoing to address this question. In addition there are a number of potential limitations with the data collection that took place as part of this study.

First is a concern for the authenticity of teacher comments. As shown in this paper, their comments were generally positive, but they could be slanted to offering comments that they may believe we want to hear. Even if theoretically they are supportive of changing their instructional methods to meet the instructional needs of more children, actually changing their practices requires a higher level of commitment which is challenging to sustain in an already challenging environment. Yet, we are guided by the ongoing relationship we have developed (even if the majority of it is maintained via text message exchanges) and the preponderance for supportive comments versus negative. Furthermore, throughout our interactions, we have emphasized that the intervention is a research study, and, therefore, their honest input is crucial for understanding the various components and how they are received.

Secondly, we have minor concerns about the validity of the number of lessons that the teachers reported they taught. However, we are not completely discouraged by the accuracy of their self-reports for several reasons. For one, the multiple time points that we collected the data without advance notification increases the validity that teachers do not have time to create pleasing reports. Second, for concurrent validity, we have text messages that asked teachers to state their most recent lesson taught. Third, even if our unannounced classroom observations (to be reported in a forthcoming paper) had documented what lesson was taught, we would not know if the lesson being observed was systematically reached or if the teacher just chose a high lesson

number to give the impression of advancing. Because we are exploring the level of support teachers need to persevere with the lessons, completing a weekly summary sheet is one component, and self-reports proximate the compliance to the intervention.

Related is our third concern of providing incentives for compliance. During the course of our interactions with the teachers, we learned that other teachers at their schools had the impression that our intervention teachers were paid for their involvement. They were not. Nevertheless, we recognize that the weekly mobile phone top up, the classroom materials, and attending the trainings had an incentivizing effect. When asked why we did not monetize teachers' efforts, we explained that the study would be compromised if it involved external incentives.

Next we address limits to the costs. The cost analysis highlights a high proportion of spending on consumables. If there are opportunities for streamlining spending here without losing intervention effectiveness, the overall cost might be significantly reduced. Also, implementation of such a program or a similar program might be expected to benefit from minor economies of scale if more teachers can be trained per workshop and economies of scope if this program can be integrated with additional school based interventions. Limitations of the costing are that the intervention took place within a larger evaluation and so the environment for implementation was different from a real world implementation. However, we do not believe this should significantly affect the results.

The cost per child of US\$ 8.57 appears relatively inexpensive compared with a range of educational interventions summarized by [Evans and Ghosh \(2008\)](#), although it is difficult to draw clear comparisons with other contexts. Ideally, a cost analysis would be broadened to consider cost-effectiveness, however this is not straightforward in this context. It would be difficult to define a single effectiveness metric since outcomes here are complete and need to reflect multiple benefits as discussed by [Jukes and colleagues in Leveling the Playing Field \(Jukes et al., 2008\)](#).

Finally, we acknowledge limitations to the intervention design. The teacher training workshops, the manual with partially scripted lesson plans, and the level of support was developed specifically for this study and this context. Certainly, some of our initial interpretations are limited to this setting, and we cannot be sure to what extent they are applicable elsewhere. Yet, we are guided by the fundamental reading processes, which are hypothesized to share commonalities across writing systems ([Perfetti, 2003](#)). We also recognize what we did not implement that has been shown to be effective (e.g., coaching, more support) in other contexts.

5. Conclusion

In conclusion, evidence from recent surveys ([Gove and Cvelich, 2010](#); [Hoogeveen and Andrew, 2011](#)) suggests that not enough Kenyan children have even minimal literacy skills to succeed academically. To address this situation, we designed, implemented, and evaluated a literacy intervention that was guided by a framework involving two sets of considerations.

Our first consideration was knowledge of the existing practice, which demonstrated that the teachers in this context were unsure of how they should teach beginning reading. Yet, some of their existing methods and perceptions were valuable starting points ([Dubeck et al., 2012](#)) to realign their instruction with methods described in the international literature. These existing methods and perceptions were reframed within our ten design recommendations described in this paper. Our second consideration was the intervention should have the potential to being scaled-up as part of a government policy. This is achievable as the HALI intervention

was relatively simple and teachers' reactions suggested that they approved of its approach. Furthermore, teacher knowledge of language and pedagogy improved and their instructional behaviours changed. And finally, examining costs suggest that it was inexpensive compared to other educational interventions. We suggest that all of these elements are critical when designing a successful literacy intervention. The intent of this description is to guide others who may be working to improve children's academic achievement in settings that may share challenges seen in coastal Kenya government schools.

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